

Cited Reference 2

Korean Patent Application Publication No. 1998-15798**[Abstract]**

The present invention relates to a digital quadrature phase shift keying (QPSK) demodulator, and more particular to a carrier recovery apparatus of QPSK demodulator which directly obtains a phase error angle from a received signal without using memory for detecting distorted phase error of the received signal. The phase recovery apparatus comprises a selection signal generator 41, a phase error calculator 43, a phase error selector 45, a loop filter 47 and a compensation signal generator 49. The selection signal generator 41 inputs I and Q-channel signals and determines which quadrant that the two signals belongs to, and then outputs a quadrant selection signal based on the results of the determination. The phase error calculator 43 executes additions and subtractions of the I and Q-channel signals, and outputs the results. The phase error selector 45 selects one of the results outputted from the phase error calculator 43, based on the quadrant selection signal of the selection signal generator 41. The loop filter 47 calculates an average error value by filtering the inputted phase error value. The compensation signal generator 49 outputs sine function value and cosine function value. The carrier recovery apparatus of the present invention can be implemented by logic circuits, such as a computing circuit for addition and subtraction of the I and Q-channel signals and a multiplexer for selecting one of computation results as the phase error value. Accordingly, the circuit structure of the QPSK demodulator is simplified by reducing memory consumption for carrier recovery.

[Fig. 3]

20: complex number multiplier
21: carrier recovery apparatus
23, 23-1, 23-2: matched filter
25: automatic gain controller
27: timing recovery apparatus
21-1: phase error detector
21-2: loop filter
21-3: compensation signal generator
27-1: clock phase detector
27-2: loop filter

[Fig. 4]

41: selection signal generator
41-1: first selection signal generator
41-2: second selection signal generator
43: phase error calculator
43-1: first calculator
43-2: second calculator
43-3: third calculator
43-4: fourth calculator
45: phase error selector
47: loop filter
49: compensation signal generator